

WHAT IS CLAIMED IS:

1. A gas sensor element comprising:

a solid electrolytic sheet provided with a pair of  
5 electrodes so as to constitute an electrochemical cell;

another sheet disposed so as to oppose to the solid  
electrolytic sheet so as to define a gas chamber therebetween  
in which gas contacts the electrodes;

a spacer disposed in the gas chamber between the solid  
10 electrolytic sheet and the another opposing sheet; and

a support member disposed in the gas chamber so as to  
support a pressing force applied in a direction of lamination  
of the solid electrolytic sheet and the another sheet.

15 2. The gas sensor element according to claim 1, wherein  
said gas chamber has a long scale extending along a longitudinal  
direction thereof and said support member is disposed at a  
position for supporting substantially a central portion of the  
gas chamber in a width direction thereof normal to the  
20 longitudinal direction thereof.

3. The gas sensor element according to claim 1, wherein  
said support member has a sectional area taken along a line  
normal to the longitudinal direction of the gas chamber, said  
25 sectional area occupies 5 to 95 % of a sectional area of the  
gas chamber in the longitudinal direction thereof.

4. A gas sensor element comprising:

a shield sheet;

a first solid electrolytic sheet constituting a monitor  
5 cell and a sensor cell;

a first spacer disposed between the shield sheet and  
the first solid electrolytic sheet so as to form a first reference  
gas chamber;

a second solid electrolytic sheet constituting a pump  
10 cell;

a second spacer disposed between the first and second  
solid electrolytic sheets so as to form a gas measurement  
chamber;

a heater sheet provided with a heating element;

15 a third spacer disposed between the second solid  
electrolytic sheet and the heater sheet so as to form a second  
reference gas chamber, said shield sheet, said first and second  
solid electrolytic sheets and said heater sheet being laminated  
in a predetermined order; and

20 support members disposed respectively in the first and  
second reference gas chambers and the gas measurement chamber.

5. A gas sensor element comprising:

a first solid electrolytic sheet constituting a first  
25 pump cell;

a second solid electrolytic sheet constituting a second

pump cell, a monitor cell and a sensor cell;

a first spacer disposed between the first and second solid electrolytic sheets so as to form a gas measurement chamber;

5 a heater sheet provided with a heating element;

a second spacer disposed between the second solid electrolytic sheet and the heater sheet so as to form a reference gas chamber, said first and second solid electrolytic sheets and said heater sheet being laminated in a predetermined order;

10 and

support members disposed respectively in the reference gas chamber and the gas measurement chamber.

6. A method of manufacturing a gas sensor element comprising  
15 the steps of:

preparing a non-sintered substrate;

forming a conductive layer on a surface of the non-sintered substrate and forming a flat portion on a surface of the conductive layer during the conductive layer forming  
20 step so that the flat portion has a width more than 3% of a width of the conductive layer;

laminating a non-sintered lamination sheet on the surface of the conductive layer on the non-sintered substrate so as to provide an intermediate product; and

25 sintering the thus laminated intermediate product.

7. The method of manufacturing a gas sensor element according to claim 6, wherein said conductive layer comprises a heat generation portion and a lead portion for connecting the heat generation portion to an external element of the gas sensor element, and said substrate comprises a heater sheet provided with a conductive layer.

8. The method of manufacturing a gas sensor element according to claim 6, wherein said conductive layer comprises an electrode and a lead portion for connecting the heat generation portion to an external element of the gas sensor element, and said substrate comprises a solid electrolytic sheet provided with a pair of conductive layers so as to constitute an electrochemical cell.

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9. A method of manufacturing a gas sensor element comprising the steps of:

preparing a non-sintered substrate;

printing a metal paste on a surface of the non-sintered substrate so as to form a conductive layer thereon, said metal paste having a viscosity of  $200 \pm 50$  [Pa · s] at a temperature of 20°C;

forming a flat portion on a surface of the conductive layer formed of the metal paste;

laminating a non-sintered lamination sheet on the surface of the conductive layer on the non-sintered substrate so as

to provide an intermediate product; and

sintering the thus laminated intermediate product.

10. The method of manufacturing a gas sensor element  
5 according to claim 9, wherein said conductive layer comprises  
a heat generation portion and a lead portion for connecting  
the heat generation portion to an external element of the gas  
sensor element, and said substrate comprises a heater sheet  
provided with a conductive layer.

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11. The method of manufacturing a gas sensor element  
according to claim 9, wherein said conductive layer comprises  
an electrode and a lead portion for connecting the heat  
generation portion to an external element of the gas sensor  
15 element, and said substrate comprises a solid electrolytic sheet  
provided with a pair of conductive layers so as to constitute  
an electrochemical cell.

12. The method of manufacturing a gas sensor element  
20 according to claim 9, wherein said metal paste is composed of  
at least one kind of noble metal consisting of Au, Pt, Pd and  
Rh, a resin and a solvent.

13. A method of manufacturing a gas sensor element comprising  
25 the steps of:

preparing a non-sintered substrate;

printing a metal paste on a surface of the non-sintered substrate for a conductive layer;

drying the metal paste so as to form the conductive layer;

forming a flat portion by pressurizing the conductive  
5 layer so that the flat portion has a width more than 3% of a width of the conductive layer;

laminating a non-sintered lamination sheet on the surface of the conductive layer on the non-sintered substrate so as to provide an intermediate product; and

10 sintering the thus laminated intermediate product.

14. The method of manufacturing a gas sensor element according to claim 13, wherein said conductive layer comprises a heat generation portion and a lead portion for connecting  
15 the heat generation portion to an external element of the gas sensor element, and said substrate comprises a heater sheet provided with a conductive layer.

15. The method of manufacturing a gas sensor element  
20 according to claim 13, wherein said conductive layer comprises an electrode and a lead portion for connecting the heat generation portion to an external element of the gas sensor element, and said substrate comprises a solid electrolytic sheet provided with a pair of conductive layers so as to constitute  
25 an electrochemical cell.

16. The method of manufacturing a gas sensor element according to claim 13, wherein said metal paste is composed of at least one kind of noble metal consisting of Au, Pt, Pd and Rh, a resin and a solvent.